Scale Your Data Center—Right into the Cloud

Ignoring the cloud is no longer an option. The potential benefits in agility and efficiency are simply too great. Yet turning your data center into a private cloud can be a complex and potentially costly undertaking, and you already have many other high-priority challenges to address as your workloads, data volumes, costs, and application requirements continue to grow.

Intel and Microsoft offer a game-changing solution to this challenge.

Microsoft Windows Server® 2012 and servers based on the Intel® Xeon® processor E5-4600/2600/2400/1600 product families provide a scalable, dynamic, and multi-tenant-aware infrastructure that lets you unify your IT environment across multiple sites and connect securely with public cloud services. Add Microsoft System Center 2012 Service Pack 1 and you can implement a complete private cloud that gives you highly-automated control over workloads and service levels, with deep insight into your applications and infrastructure.

Yet there is no need for disruptive change. The combined platform also provides dramatically increased capability and value for existing solutions, along with a unified framework for managing and securing all your IT assets—physical, virtual, and cloud. With this uniquely integrated and cost-effective solution, you can implement targeted improvements in performance, power efficiency, manageability, and security throughout your existing environment, while gradually implementing cloud functionality to transform the way you deliver and manage IT services.
Start Building Your Cloud Today

With Windows Server 2012 and the Intel Xeon processor E5 family, every server you add to your data center provides an optimized foundation for your private cloud. Microsoft has introduced extensive new functionality based on its experience in managing some of the world’s most advanced cloud environments, including Microsoft Windows Live,* Hotmail,* and Bing.* Intel has also integrated next-generation technologies to enable better performance, energy efficiency, and resource utilization, more dynamic workload and data movement, and improved security in dense, multi-tenant cloud environments.

The two companies have worked together to ensure optimized performance and functionality across the entire server, network, and storage infrastructure, including both physical systems and virtual resources. A few of the most important new cloud capabilities are described below.

- **Secure multi-tenancy for improved utilization at every layer.** Isolate workloads across servers, networks, and storage systems so sensitive applications can be safely hosted on shared infrastructure. You can configure guaranteed service level agreements (SLAs), implement chargeback based on usage, and provide self-service IT for business units.

- **Dynamic resource control for performance optimization and business continuity.** Migrate virtual machines and storage within and between facilities quickly and without downtime for workload balancing and high availability. Virtual network assignments and IP addresses are automatically maintained to enable simple, secure migrations. You can also automate virtual machine replication and failover using Hyper-V* Replica.

- **Advanced cloud management to deliver better IT services at lower cost.** Windows PowerShell* 3.0 includes more than 2,300 new cmdlets and is integrated into all server roles. You can control almost every aspect of the operating system to automate tasks, reduce administrative overhead, and reduce the likelihood of human error. Add Microsoft System Center 2012 SP1 to provide comprehensive infrastructure and application management across multiple sites, with unified support for heterogeneous hypervisors and operating systems.

- **Enhanced security and compliance to protect your business.** Microsoft Dynamic Access Control* lets you centrally deploy and manage file authorization policies to protect sensitive information on shared infrastructure, both within and beyond your data center. Intel® Advanced Encryption Standard New Instructions1 (Intel® AES-NI) enhances this protection. By accelerating AES-based encryption and reducing overhead, it lets you implement encryption pervasively for stronger security and improved compliance.

Solve Your Toughest Data Center Challenges

The agility and efficiencies of cloud computing won’t solve all your IT challenges. Workloads and data sets continue to grow rapidly and you have new applications to deploy and integrate. Microsoft Windows Server 2012 and Intel Xeon processor E5 family-based servers provide extensive new capabilities for addressing fast-growing IT requirements. You can solve your toughest challenges, while simultaneously laying an optimized foundation for your private cloud.

Scale Performance and Reliability at Every Point

Enjoy major performance gains as you replace aging servers. Two-socket servers based on the Intel Xeon processor E5 family boosts performance by up to 80% versus the previous-generation Intel® Xeon® processor 5600 series2 and improve energy efficiency by 50% to reduce power and cooling costs.3 You can achieve even higher performance gains—up to 83 percent higher4—with new density-optimized four-socket servers based on the Intel® Xeon® processor E5-4600.

You can also support mission-critical applications in your private cloud. Servers based on the Intel® Xeon® processor E7 family scale to support the most demanding enterprise workloads. Windows Server 2012 provides comparable scalability with support for up to 64 logical processors and 4 terabytes of memory per physical server. In combination with SQL Server* 2012, the combined platform has demonstrated world-record performance for online transaction processing workloads based on the TPC-C benchmark5:

The Intel Xeon processor E7 family provides advanced error management through Machine Check Architecture recovery, which is fully supported by Windows Server 2012 and SQL Server 2012. Errors are automatically detected, corrected, and contained to enable the highest levels of system uptime and data integrity.

Virtualize More and Heavier Workloads

Extend the benefits of virtualization throughout your data center. With Microsoft Windows Server 2012 Hyper-V, virtual machines can be configured with up to 64 virtual processors and 1 terabyte of memory, so you have the scalability you need to support demanding workloads. Intel® Virtualization Technology® (Intel® VT) provides extensive hardware assists for core virtualization processes and Hyper-V is tuned to take full advantage of these enhancements. The result is a virtualization platform that delivers near-native performance with enhanced reliability and security.

Consolidating demanding workloads onto shared infrastructure can place extreme demands on server I/O. The Intel Xeon processor E5 family is designed to keep data flowing rapidly as I/O requirements continue to increase. These processors provide twice the I/O
bandwidth\(^7\) of previous-generation processors and reduce I/O latency by up to 30\(^\circ\)\(^7\) Windows Server 2012 and Intel\(^\circ\) Ethernet 10 Gigabit Converged Network Adapters extend these advantages to the network connection to provide you with:

**Fast, low-overhead communications.** You can configure direct connections between virtual machines and network adapters to deliver near-native I/O performance in virtualized environments. Packet-sorting is offloaded to silicon in the network adapter to provide even faster performance and to free the hypervisor for other tasks.

**Simpler connectivity and improved utilization.** You can share physical network connections among multiple virtual machines to maximize utilization and reduce costs. Bandwidth can be allocated flexibly and new quality of service (QoS) features let you provide bandwidth assurances for critical workloads.

**A unified network across your data center.** You can consolidate all your server and storage traffic onto a single, high-performance 10 Gigabit Ethernet network to simplify your data center and substantially reduce hardware costs. Support for Fibre Channel over Ethernet (FCoE) and iSCSI functionality are integrated into the operating system.

**Simple, fast virtual machine migrations.** You can move multiple virtual machines on-demand and without manual intervention. Virtual network assignments and IP addresses are preserved during migrations, not only within your data center, but into the cloud.

**Secure network virtualization.** Hyper-V and Intel Ethernet Server Adapters support the PCI-SIG Single-Root I/O Virtualization (SR-IOV) specification to enable flexible network virtualization with strong isolation of communications between virtual machines and network adapters for secure multi-tenancy. The Hyper-V Extensible Switch can be used in combination with third-party plug-ins to integrate additional functionality, such as traffic monitoring, firewall filters, and switch forwarding.

**Drive New Storage Efficiencies**

IDC is predicting a 44\(^\times\) increase in digital data for the decade ending in 2020,\(^9\) so scalable and affordable storage solutions will be increasingly vital going forward. Windows Server 2012 delivers extensive enhancements at every layer of the storage stack to help you scale performance more cost-effectively than ever before, while simultaneously improving reliability, availability, and flexibility.

Features such as virtual fibre channel and offloaded data transfers improve flexibility and performance for existing storage area networks (SANs). You can also ramp up your storage capability without the high cost and complexity of a SAN. Windows Server 2012 includes Server Messaging Block (SMB) 3.0, which allows IT organizations to layer feature-rich, SAN-like storage functionality on top of inexpensive disk arrays. Affordable file servers become virtualized resource pools that can be provisioned on-demand to address high-end storage requirements.
- SAN-like performance at low cost. Aggregate bandwidth across multiple Intel® Ethernet adapters to dynamically scale storage performance. You can take advantage of SMB Direct in Windows Server 2012 and Remote Direct Memory Access (RDMA) in NetEffect™ Ethernet Server Cluster Adapters to enable extremely fast data transfers and live migrations. With these capabilities, you can shape storage performance to support Hyper-V, SQL Server, and other demanding applications, even as your data volumes continue to grow.

- Continuous data access. Implement transparent storage failover and network fault tolerance to ensure high availability for critical data. You can also provision virtual storage spaces as mirrored or striped sets and physical drives as hot spares, so hardware failures can be resolved automatically and transparently.

- Improved utilization. Take advantage of advanced storage features such as data deduplication, thin provisioning, and trim to dramatically increase storage capacity without adding disks.10

- Simple, automated management. Manage physical and virtual storage, including third-party external storage systems, from a single interface and use Windows PowerShell for advanced automation.

Learn More

• About the Intel Xeon processor E5 family: www.intel.com/content/www/us/en-processors/xeon/xeon-processor-5000-sequence.html


• About the combined platform: software.intel.com/sites/billboard/sites/default/files/downloads/23922%20-%20Intel-MSFT%20WP%20FINAL.PDF

• About building your private cloud (with multi-vendor resources from Intel® Cloud Builders): www.intel.com/content/www/us/en/cloud-computing/cloud-builders-provide-proven-advice.html

1 Intel® AES-NI requires a computer system with an AES-NI enabled processor, as well as non-Intel software to execute the instructions in the correct sequence. AES-NI is available on select Intel® processors. For availability, consult your reseller or system manufacturer. For more information, see http://software.intel.com/en-us/articles/intel-advanced-encryption-standard-instructions-aes-ni/


5 SPEC® E® world record performance claim based on top ranked result of NED Express™/8500/11800-8-E published using eight Intel® Xeon® processors E7-8770 (8P/186 OC/1607) scoring 4,614 tps@ $450.18USD available 4/2/2012 compared to all other results as of May 18, 2012. SPEC® E® performance is defined as the Transaction Processing Performance Council. For more information, please visit http://www.spec.org.

6 Intel® Virtualization Technology (Intel® VT) requires a computer system with an enabled Intel® processor, BIOS, virtual machine monitor (VMM) and, for some uses, certain platform software enabled for it. Functionality, performance, or other benefits will vary depending on hardware and software configurations and may require a BIOS upgrade. Software applications may not be compatible with all operating systems. Please check with your application vendor.

7 The Intel Xeon processor E5 family supports the Peripheral Component Interconnect Express (PCIe) specification. With 8 GT/s and 128b/130b encoding, this specification enables twice the interconnect bandwidth of the PCIe® 2.0 specification.

8 SAN-like performance at low cost. Aggregate bandwidth across multiple Intel® Ethernet adapters to dynamically scale storage performance. You can take advantage of SMB Direct in Windows Server 2012 and Remote Direct Memory Access (RDMA) in NetEffect™ Ethernet Server Cluster Adapters to enable extremely fast data transfers and live migrations. With these capabilities, you can shape storage performance to support Hyper-V, SQL Server, and other demanding applications, even as your data volumes continue to grow.

9 Intel® AES-NI requires a computer system with an AES-NI enabled processor, as well as non-Intel software to execute the instructions in the correct sequence. AES-NI is available on select Intel® processors. For availability, consult your reseller or system manufacturer. For more information, see http://software.intel.com/en-us/articles/intel-advanced-encryption-standard-instructions-aes-ni/

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